IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CONTINUING APPLICATION FOR LETTERS PATENT UNDER 37 CFR 1.60

Applicant: Ronald J. Zappe
Application No.: (New) Group Art Unit: 1723
Filed: Herewith
Examiner: Matthew Savage
For: ADJUSTABLE CONTINUOUS FILTRATION
SYSTEM FOR COOKING
FATS AND COOKING OILS

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

This is a request for filing a ( ) continuation (x) divisional application under 37 CFR § 1.60, of pending prior application No. 09/206,204, filed 12/05/98, which is a continuation-in-part of application Serial No. 09/010,272, filed 01/21/98, now U.S. Patent No. 5,846,409.

Enclosed is a copy of the prior application as originally filed. The attached papers are a true copy of prior application No. 09/206,204, as originally filed on 12/05/98.

The filing fee as calculated below is paid herewith by enclosed/attached check. Applicant has small-entity status.

Basic Fee	$345.00
Total Claims (02 - 20) x $9.00	0.00
Independent Claims (1 - 3) x $39.00	0.00
Total Filing Fee	345.00

Please cancel in this application claims 1 - 15 and 17 - 19 of the prior application before calculating the filing fee.

Kindly amend the specification by inserting before the first line the sentence: -- This is a ( ) continuation

(x) division of application Serial No. 206,204, filed Dec. 05, 1998, which is a continuation-in-part of application Serial No. 010,272, filed Jan. 21, 1998, now U.S. Patent No. 5,846,409. -- .

Priority has not been claimed under 35 U.S.C. § 119.

A new set of formal drawings is submitted herewith.

The executed form for power of attorney appears in the original papers in the prior application No. 09/206,204, filed Dec. 05, 1998. Power of attorney was given to Reginald F. Roberts, Jr., Registration No. 29,340, whose address is P.O. Box 4535, Baton Rouge, Louisiana 70821-4535, and whose telephone number is (225)343-8500. Please note that both the address and the telephone number of the agent of record have changed.

Respectfully submitted

Reginald F. Roberts, Jr.

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December 4, 1998

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Re: Application of Ronald J. Zappe
Agent's Docket No.: R-205-B

Sir:

Enclosed for filing is the application for Letters Patent identified above.

Also enclosed are:

[x] 7 sheets of drawings
[x] a declaration and power of attorney
[ ] an information-disclosure statement
[x] a declaration claiming small-entity status
[ ] a petition to make the application special
[x] a check or money order for the filing fee
[ ] an assignment of the application
[ ] a check / money order for assignment recordal
[ ] a check / money order for the petition fee
[x] a copy of the parent application

The filing fee was calculated as follows:

Basic Fee (Small Entity):	$395
Independent Claims (8 - 3) x $41:	205
Total Claims (20- 20) x $11:	0
Total	$600

Respectfully submitted

Reginald F. Roberts, Jr.

Reginald F. Roberts, Jr.
Registration No. 29,340
Agent for Applicant

RFR:rfr
Encl/Attach

Chemical, Mechanical, Electrical, and General Patent Practice

Applicant ~~or Patentee~~: Ronald J. Zappe
Serial ~~or Patent~~ No.: (NEW)
Filed ~~or Issued~~: Herewith
For: ADJUSTABLE CONTINUOUS FILTRATION SYSTEM FOR Cooking Fats and Cooking Oils

Agent's Docket No.: R-205-B

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled ADJUSTABLE CONTINUOUS FILTRATION SYSTEM FOR Cooking Fats and Cooking Oils described in

(✓) the specification filed herewith
( ) application serial no. _____, filed _____
( ) patent no. _____, issued _____.

I have not assigned, granted, conveyed or licensed and am under no obligation to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made an invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

(✓) no such person, concern, or organization
( ) persons, concerns, or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME _____
ADDRESS _____
( )INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( )NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____
( )INDIVIDUAL ( )SMALL BUSINESS CONCERN ( )NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____
( )INDIVIDUAL ( )SMALL BUSINESS CONCERN ( )NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
Ronald J. Zappe		
✓ Signature of Inventor	Signature of Inventor	Signature of Inventor
✓ 12/4/98		
Date	Date	Date

APPLICATION FOR LETTERS PATENT

by

Ronald J. Zappe

for an Invention Entitled

ADJUSTABLE CONTINUOUS FILTRATION SYSTEM FOR COOKING FATS AND COOKING OILS

SPECIFICATION

R-205-B

ADJUSTABLE CONTINUOUS FILTRATION SYSTEM FOR COOKING FATS AND COOKING OILS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of Application No. 09/010,272, filed 01/21/98.

BACKGROUND OF THE INVENTION

The present invention relates to filtration. More particularly, the invention relates to a filtration system for quality control of cooking fats and cooking oils.

In the culinary industry filtration is generally employed to purify used cooking fats and cooking oils. In the absence of such purification, impurities build up in the fats and oils to a level which is unacceptable by industry standards.

As fats and oils are used in cooking, they tend to break down, degrade, and hydrolyze to free fatty acids, glycerol, and other polar products. The free fatty acids are among the more harmful products of this degradation. The recommended maximum acceptable level for free fatty acids is three to four percent.

The prior art discloses filtration systems for removing such impurities from cooking fats and cooking oils; see, e.g., U.S. Patents No. 5,597,601, 4,747,944, 3,667,613, 5,247,876, 3,107,601, 2,698,092, and 3,630,361. What is lacking, however, is a filtration system which is adjustable in accordance with the quality of the cooking fat or cooking oil which is being filtered. The present invention provides such a system.

More specifically, the prior art fails to provide

filtration apparatus in which a predetermined portion of the cooking fat or cooking oil is recycled or routed to the filtration system before being discharged therefrom. For example, U.S. Patent No. 4,747,944 to George discloses a filtration system in which filtrate is recirculated by being discharged into a vessel which contains unfiltered cooking fat or cooking oil. The mixture of partially-filtered fat or oil is then returned to the filter. An obvious drawback of this system is the absence of any mechanism for controlling the proportion of the fat or oil which is recycled to the filter. A second apparent limitation is the requirement of a vessel for mixing the liquid discharged from the filter with untiltered liquid.

British Patent 751,892 discloses a filtration system for mineral oil. The system includes a part-flow filter cartridge which controls the proportion of mineral oil which is recycled to a filter. It will be apparent to those skilled in the art that this control mechanism lacks flexibility with regard to varying the proportion of fluid which is routed or recycled to the filter. This limitation is particularly serious with regard to the desirability of **continuous** variation of the proportion of fluid which is recycled, or which is routed to the filter before being discharged from the filtration system.

SUMMARY OF THE INVENTION

In general, the present invention in a first aspect provides an adjustable continuous recycle filtration system. The filtration system comprises a filter; means for conveying a fluid to the filter; means for recycling a portion of the fluid to the filter; and means for controlling the proportion of the fluid which is recycled to the filter by controlling the size of an orifice in a passageway through which the fluid flows.

A first embodiment of the adjustable recycle filtration

system comprises a filter; means for pressurizing a fluid to be conveyed to the filter; a first passageway for receiving the pressurized fluid from the pressurization means; a second passageway for receiving fluid discharged from the filter; means for lowering the pressure in the second passageway below the pressure in the first passageway; a third passageway connected to the pressure-lowering means; a fourth passageway connected to the third passageway and to the filter; a fifth passageway connected to the third and fourth passageways; a sixth passageway for discharging fluid from the fifth passageway; and an orifice restriction disposed between the fifth and sixth passageways, for controlling the rate of flow of the fluid through the fourth, fifth, and sixth passageways. The first, second, third, fourth, fifth, and sixth passageways, the pressure-lowering means, and the orifice restriction are constructed and arranged so that fluid discharged from the third passageway is split into a first stream flowing through the fourth passageway and a second stream flowing through the fifth passageway, and the proportion of fluid which is recycled to the filter before being discharged through the sixth passageway is controlled and determined by the size of an orifice in the orifice restriction between the fifth and sixth passageways.

A second embodiment of the adjustable recycle filtration system comprises a filter; a first passageway which provides an inlet passageway for a fluid to be conveyed to the filter; a second passageway which provides a passageway for fluid discharged from the filter; means for lowering the pressure in the second passageway below the pressure in the first passageway; a third passageway connected to the pressure-lowering means; a fourth passageway connected to the third passageway and to the filter; a fifth passageway interconnecting the third and fourth passageways; and an orifice restriction disposed in the third passageway, for controlling the rate of flow

through the fourth and fifth passageways; the first, second, third, fourth , and fifth passageways, the pressure-lowering means , and the orifice restriction being constructed and arranged so that fluid discharged from the third passageway is split into a first stream flowing through the fourth passageway and a second stream flowing through the fifth passageway, and the proportion of the fluid which is recycled to the filter before being discharged through the fifth passageway is controlled and determined by the size of an orifice in the orifice restriction disposed in the third passageway.

A third embodiment of the adjustable recycle filtration system comprises a filter; means for pressurizing a fluid to be conveyed to the filter; a first passageway for receiving the pressurized fluid from the pressurization means; a second passageway for receiving fluid discharged from the filter; a third passageway connected to the pressure-lowering means; a fourth passageway connected to the third passageway and to the filter; and a fifth passageway connected to the third and fourth passageways, for discharging fluid from the filtration system. The first, second, third, fourth, and fifth passageways, and the pressure-lowering means are constructed and arranged so that fluid discharged from the third passageway is split into a first stream flowing through the fourth passageway and a second stream flowing through the fifth passageway, and the proportion of the fluid which is recycled to the filter before being discharged from the fifth passageway is controlled and determined by the widths of the orifices in the fourth and fifth passageways.

In a second aspect the present invention provides an adjustable continuous bypass filtration system. A first embodiment thereof comprises a filter; means for pressurizing a fluid to be conveyed to the filter; a first passageway for receiving the pressurized fluid from the pressurization means; a second passageway for receiving

fluid discharged from the filter; means for lowering the pressure in the second passageway below the pressure in the first passageway; a third passageway connecting the first passageway and the filter to one another; a fourth passageway connected to the first and third passageways; a fifth passageways for discharging fluid from the fourth passageway; and an orifice restriction disposed in the third passageway, for controlling the rate of flow of the fluid through the third, fourth, and fifth passageways. The pressure-lowering means are disposed between and interconnect the second, the fourth, and fifth passageways. The second passageway connects the pressure-lowering means and the filter to one another. The first, second, third, fourth, and fifth passageways, the pressure-lowering means, and the orifice restriction are constructed and arranged so that fluid discharged from the first passageway is split into a first stream flowing through the third passageway and a second stream flowing through the fourth passageway, and the proportion of the fluid which is routed to the filter before being discharged through the fifth passageway is controlled and determined by the size of an orifice in the orifice restriction disposed in the third passageway.

A second embodiment of the adjustable bypass filtration system comprises a filter; a first passageway for conveying a fluid to the filter; a second passageway for discharging fluid from the filter; means for lowering the pressure in the second passageway below the pressure in the first passageway; a third passageway connecting the first passageway and the filter to one another; a fourth passageway connected to the first and third passageways; a fifth passageway for discharging the fluid from the fourth passageway; and an orifice restriction disposed in the fourth passageway, for controlling the rate of flow of the fluid through the third, fourth, and fifth passageways; the pressure-lowering means being disposed between the fourth and fifth passageways, the second passageway interconnecting

the pressure-lowering means, the filter, and the fourth passageway; the first, second, third, fourth, and fifth passageways, the pressure-lowering means, and the orifice restriction being constructed and arranged so that fluid discharged from the first passageway is partitioned into a first stream flowing through the third passageway and a second stream flowing through the fourth passageway, and the proportion of the fluid which is routed to the filter or is discharged from the system is controlled and determined by the size of an orifice in the orifice restriction disposed in the fourth passageway.

A third embodiment of the adjustable bypass filtration system comprises a filter; a first passageway for conveying a fluid to the filter; a second passageway for discharging fluid from the filter; means for lowering the pressure in the second passageway below the pressure in the first passageway; a third passageway connecting the first passageway and the filter to one another; a fourth passageway connected to the first and third passageways; and a fifth passageway for discharging the fluid from the fourth passageway; the pressure-lowering means being disposed between the fourth and fifth passageways, the second passageway interconnecting the pressure-lowering means, the filter, and the fourth passageway; the first, second, third, fourth, and fifth passageways, and the pressure-lowering means being constructed and arranged so that fluid discharged from the first passageway is partitioned into a first stream flowing through the third passageway and a second stream flowing through the fourth passageway, and the proportion of the fluid which is routed to the filter or is discharged from the system is controlled and determined by the size of orifices in the third and fourth passageways.

In a fourth embodiment of the adjustable bypass filtration system, orifice restrictions are provided in both third and fourth passageways.

A fifth embodiment of the adjustable bypass filtration

system comprises a filter; a first passageway which provides an inlet passageway for a fluid to be conveyed to the filter or to be discharged from the system; a second passageway which provides a passageway for fluid discharged from the filter; a third passageway connected to the first passageway and to the filter; a fourth passageway interconnecting the first and second passageways; an orifice restriction disposed in the fourth passageway, for controlling the size of an orifice in the fourth passageway; and a fifth passageway for discharging fluid from the fourth passageway; whereby the fluid discharged from the second passageway is split into a first stream flowing through the third passageway to the filter and a second stream flowing through the fourth passageway to be discharged through the fifth passageway, and the proportion of the fluid which is routed to the filter or which is discharged through the fifth passageway is controlled and determined by the size of an orifice in the orifice restriction disposed in the fourth passageway.

The direction of fluid flow through the filter can be reversed if reverse flow through the filter should be desired or required.

In a third aspect the invention provides a method for controlling the quality of cooking fats and cooking oils. The method comprises providing a filter for filtering the cooking fats or cooking oils; routing or recycling a portion of a cooking fat or a cooking oil to the filter; and controlling the proportion of the cooking fat or the cooking oil which is routed or recycled to the filter before being discharged. The discharged cooking fat or cooking oil is analyzed for quality control. If the quality of the discharged cooking fat or cooking oil is below industry standards, the proportion of the cooking fat or cooking oil which is recycled is increased. If the quality of the discharged cooking fat or cooking oil is appreciably above industry standards, the proportion of the cooking fat or cooking oil which is recycled is decreased.

In a fourth aspect the invention provides a method for controlling the proportion of fluid recycled through a filtration system. The method comprises providing a filter for filtering the fluid; pressurizing the fluid for conveyance to the filter; conveying the pressurized fluid to the filter; recycling a portion of the fluid to the filter; and controlling the proportion of the fluid which is recycled to the filter before being discharged from the system by controlling the size of an orifice in a passageway through which the fluiid flows.

In a fifth aspect the invention provides a method for controlling the proportion of a fluid which is routed to the filter of a filtration system, and the proportion of said fluid which is discharged from the system without passing through the filter. The method comprises providing a filter for filtering the fluid; conveying a portion of the fluid to the filter through a first passageway; discharging the filtered fluid and a portion of the unfiltered fluid through a second passageway; and controlling the proportions of the fluid flowing through the first and second passageways by disposing an orifice restriction in the first or in the second passageway.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of a first embodiment of an adjustable continuous recycle filtration system, made in accordance with the principles of the present invention.

FIG. 1-A is a schematic representation of a second embodiment of an adjustable continuous recycle filtration system, made in accordance with the principles of the present invention.

FIG. 2 is a schematic representation of a first embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention.

FIG. 2-A is a schematic representation of a second embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention.

FIG. 2-B is a schematic representation of a third embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention.

FIG. 3 is a schematic representation of a portion of a fourth embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention.

FIG. 4 is a schematic representation of a second embodiment of an adjustable continuous recycle filtration system, made in accordance with the principles of the present invention.

FIG. 5 is a schematic representation of reverse fluid flow through the adjustable and bypass continuous filtration systems.

FIG. 6 is a schematic representation of a fourth embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

More specifically, reference is made to **FIG. 1**, in which is shown a first embodiment of an adjustable continuous recycle filtration system, made in accordance with the principles of the present invention, and generally designated by the numeral **10**.

A pump **1** discharges a fluid into line **7**. An ejector **2** creates a partial vacuum in line 11, and/or lowers the pressure in line **11** below that in line **7**. Fluid discharged from the ejector **2** is split into first and second streams which flow through lines **8** and **9**, respectively. Fluid in

line **8** enters a container **13** filled with a filter medium **14**, percolates or diffuses therethrough, and after passing through a particle-retaining screen **4** exits through line **11** and is recycled to the ejector **2**. An orifice restriction **3** between lines **9** and **12** controls the rate of fluid flow through lines **8**, **9**, and **12** by imposing a pressure drop across the orifice restriction **3**. By varying the size of the orifice, the rates of flow through lines **8**, **9**, and **12** can be varied as much as desired. Thus, when the pressure drops across the container **13** and the orifice restriction **3** are equal, the rate of flow through line **8** is the same as through lines **9** and **12**. By increasing the restriction, i.e. by decreasing the size of the orifice between lines **9** and **12**, a slower rate of flow is obtained through lines **9** and **12** than through line **8**. The opposite effect is achieved by decreasing the restriction, i.e by increasing the size of the orifice between lines **9** and **12**, so that more of the partially-filtered fluid is discharged through line **12** than is recycled to the container **13** through line **8**. Preferably, the orifice restriction **3** is constructed and arranged to enable continuous variation of the degree of restriction without interrupting the flow to change or adjust the orifice-restriction device. One means of so doing is to use a valve, preferably a needle valve, as the orifice restriction **3**.

Reference is now made to **FIG. 1-A**, in which is shown a second embodiment of an adjustable continuous recycle filtration system, made in accordance with the principles of the present invention, generally designated by the numeral **10A**. In this embodiment the orifice restriction **3** is disposed in line **8** rather than in line **9**. The function of the orifice restriction **3** remains the same; viz., to control the rates of flow through lines **8** and **9**, thereby controlling the proportion of fluid recycled to the filter **13**.

Reference is now made to **FIG. 2**, in which is shown a first embodiment of an adjustable continuous bypass

filtration system, made in accordance with the principles of the present invention, and generally designated by the numeral **20**.

The adjustable continuous bypass filtration system **20** comprises a filter **13**; a pump **1**; a first passageway **7** connected to the pump **1**; a second passageway **11** for receiving fluid discharged from the filter **13**; an ejector **2** for lowering the pressure in the second passageway **11** below the pressure in the first passageway **7**; a third passageway **8** connecting the first passageway **7** and the filter **13** to one another; a fourth passageway **9** connected to the first **7** and third **8** passageways; a fifth passageway **12** for discharging fluid from the fourth passageway **9**; and an orifice restriction **3** disposed in the third passageway **8**, for controlling the rate of flow of the fluid through the third **8**, fourth **9**, and fifth **12** passageways. The ejector **2** is disposed between and interconnects the second **11**, fourth **9**, and fifth **12** passageways. The fluid discharged from the first passageway **7** is split into a first stream flowing through the third passageway **8**, and a second stream flowing through the fourth passageway **9**. The proportion of the fluid which is routed to the filter **13** via the third passageway **8** before being discharged through the fifth passageway **12** is controlled and determined by the size of an orifice in the orifice restriction **3** disposed in the third passageway **8**.

Reference is now made to **FIG. 2-A**, in which is shown a second embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention, and generally designated by the numeral **20A**. In this embodiment the orifice restriction **3** is disposed in the fourth passageway **9** instead of in the third passageway **8**. The function of the orifice restriction **3** is the same for both embodiments **20** and **20A**; viz., to control the proportions of fluid routed to the filter **13** via the third passageway **8** and to the fourth passageway **9**, from which it is discharged through the fifth passageway **12**.

Reference is now made to **FIG. 2-B**, in which is shown a third embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention, and generally designated by the numeral **20B**. In this embodiment there are no orifice restrictions **3**, and the proportion of fluid which is conveyed to the filter **13** through the third passageway **8** and to the fourth passageway **9** is determined by the size of orifices in the third passageway **8** and fourth passageway **9**.

Reference is now made to **FIG. 3**, in which is shown a portion of a fourth embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention. In this fourth embodiment, orifice restrictions **3** are provided in lines **8** and **9**, and the ejector **2** interconnects lines **9**, **11**, and **12**.

Reference is now made to **FIG. 4**, in which is shown a second embodiment of an adjustable recycle filtration system, made in accordance with the principles of the present invention, and generally designated by the numeral **30**. The second embodiment **30** of the filtration system is similar to the first embodiment **10** shown in **FIG. 1**, except that in the second embodiment **30** the orifice restriction **3** and line **12** are omitted from the system. In the second embodiment **30**, the proportion of fluid recycled to the filter **13** is controlled and determined by the sizes of orifices in lines **8** and **9**.

Reference is now made to **FIG. 5**, which schematically represents reversing the direction of fluid flow through the filter **13** of the recycle and bypass filtration systems disclosed herein.

Reference is now made to **FIG. 6**, in which is shown a fifth embodiment of an adjustable continuous bypass filtration system, made in accordance with the principles of the present invention, and generally designated by the numeral **40**. This embodiment differs from the second embodiment **20A** thereof shown in **FIG. 2-A** by omission and absence of the ejector **2**.

In preferred embodiments of the present invention, the adjustable continuous filtration systems are used to filter and/or purify used cooking fats and cooking oils. For this purpose the cooking fat or cooking oil being discharged from the filtration system is tested for quality control, to determine whether it satisfies the specifications of the industry. If the discharged cooking fat or cooking oil is not within the specifications, the proportion of the cooking fat or cooking oil being routed or recycled through line **8** is increased. If the fat or oil tests far better than is required by the specifications, the rate of flow through line **8** is decreased. If purification other than filtration is needed, an adsorbent is added to or substituted for the filter medium **14**. Since fats are by definition solid at room temperature, heat and/or thermal insulation are/is supplied or provided to maintain the fats in a liquid state while circulating in and through the filtration system.

It is to be understood that, if desired, a filter press or filter leaf could be used instead of a container filled with a filter medium. Such substitution would in no way affect the basic concept of the present invention. Moreover, instead of an ejector, any other means of lowering the pressure in line **11** would suffice, and would lie within the scope of the present invention. The use of an ejector is, however, clearly advantageous and is to be preferred, because it provides a compact means for so doing which is simpler, requires less space, and comprises no moving parts as compared, e.g., to a vacuum pump or a vacuum line.

Many restaurants continue to use their cooking fats and cooking oils well beyond the recommended maximum 3 - 4% fatty-acid content. This is primarily because, until recently, there has been no accurate, simple, and rapid method for determining the percentage of free fatty acids therein. There is now, however, an analytical method which is simple, quick, and accurate. This method is preferred for determining the free fatty-acid content of cooking fats and

cooking oils in combination with the filtration/purification systems and methods herein described. The method is described in detail in U.S. Patent No. 5,620,897 to Zappe, which is hereby incorporated by reference.

The term "fluid" includes liquids, vapors, and gases. While the preferred embodiments of the present invention utilize liquid cooking fats and cooking oils as the filtrand, the apparati and methods are by no means limited or restricted in scope to the filtration and/or purification of liquids, and include the filtration and purification of vapors and gases to remove, e.g., particulate solids therefrom.

Moreover, it will be apparent to those skilled in the art that the method of analyzing cooking fats and cooking oils, and adjusting the proportion thereof routed or recycled to the filter **13** is applicable to fluids in general, and the extension of this method to fluids generally is within the scope of the present invention.

I claim:

1. An adjustable continuous recycle filtration system, comprising:

(a) a filter;

(b) means for conveying a fluid to the filter;

(c) means for recycling a portion of the fluid to the filter; and

(d) means for controlling the proportion of the fluid which is recycled to the filter by controlling the size of an orifice in a passageway through which the fluid flows.

2. The filtration system of claim 1, wherein the means for controlling the size of the orifice include an orifice restriction.

3. The filtration system of claim 2, wherein the orifice restriction is variable, thereby providing a range of proportions of the fluid which is recycled to the filter.

4. The filtration system of claim 2, wherein the orifice restriction is continuously variable, thereby providing a continuous range of proportions of the fluid which is recycled to the filter.

5. The filtration system of claim 2, wherein the orifice restriction includes a valve, thereby providing a range of proportions of the fluid which is recycled to the filter.

6. The filtration system of claim 2, wherein the orifice restriction includes a needle valve, thereby providing a continuous range of proportions of the fluid which is recycled to the filter.

7. A continuous split-stream bypass filtration system, the system comprising:

(a) a filter;

(b) a first passageway (7) which provides an inlet passageway for a fluid to be conveyed to the filter or to be discharged from the system;

(c) a second passageway (11) which provides a passageway for fluid discharged from the filter;

(d) a third passageway (8) connected to the first passageway (7) and to the filter;

(e) a fourth passageway (9) interconnecting the first (7) and second (11) passageways;

(f) an orifice restriction disposed in the fourth passageway, for controlling the size of an orifice in the fourth passageway (9); and

(g) a fifth passageway (12) for discharging fluid from the fourth passageway (9);

whereby the fluid discharged from the second passageway (11) is split into a first stream flowing through the third passageway (8) to the filter and a second stream flowing through the fourth passageway (9) to be discharged through the fifth passageway (12), the proportion of the fluid which is routed to the filter or which is discharged through the fifth passageway (12) being controlled and determined by the size of the orifice in the fourth passageway (9).

8. A continuous split-stream bypass filtration system, comprising:

(a) a filter;

(b) a first passageway (7) for conveying a fluid to the filter;

(c) a second passageway (11) for discharging fluid from the filter;

(d) means for lowering the pressure in the second passageway (11) below the pressure in the first passageway (7);

(e) a third passageway (8) connecting the first passageway (7) and the filter to one another;

(f) a fourth passageway (9) connected to the first (7) and third (8) passageways;

(g) a fifth passageway (12) for discharging the fluid from the fourth passageway (9); and

(h) an orifice restriction (3) disposed in the fourth passageway (9), for controlling the rate of flow of the fluid through the third (8), fourth (9), and fifth (12) passageways;

the pressure-lowering means being disposed between the fourth (9) and fifth (12) passageways, the second passageway (11) interconnecting the pressure-lowering means (2), the filter, and the fourth passageway (9), the first (7), second (11), third (8), fourth (9), and fifth (12) passageways, the pressure-lowering means (2), and the orifice restriction (3) being constructed and arranged so that fluid discharged from the first passageway (7) is partitioned into a first stream flowing through the third passageway (8) and a second stream flowing through the fourth passageway (9), and the proportion of the fluid which is routed to the filter or is discharged from the system is controlled and determined by the size of an orifice in the orifice restriction (3) disposed in the fourth passageway (9).

9. A continuous split-stream bypass filtration system, comprising:

(a) a filter;

(b) a first passageway (7) for conveying a fluid to the filter;

(c) a second passageway (11) for discharging the fluid from the filter;

(d) means (2) for lowering the pressure in the second passageway (11) below the pressure in the first passageway (7);

(e) a third passageway (8) connecting the first passageway (7) and the filter to one another;

(f) a fourth passageway (9) connected to the first (7) and third (8) passageways; and

(g) a fifth passageway (12) for discharging the fluid from the fourth passageway (9);

the pressure-lowering means (2) being disposed between the fourth (9) and fifth (12) passageways, the second passageway (11) interconnecting the pressure-lowering means (2), the filter, and the fourth passageway (9); the first (7), second (11), third (8), fourth (9), and fifth (12) passageways, and the pressure-lowering means (2) being constructed and arranged so that fluid discharged from the first passageway (7) is partitioned into a first stream flowing through the third passageway (8) and a second stream flowing through the fourth passageway (9), and the proportion of the fluid which is routed to the filter or is discharged from the system is controlled and determined by the sizes of orifices in the third (8) and fourth (9) passageways.

10. An adjustable recycle filtration system, comprising:

(a) a filter;

(b) a first passageway (7) which provides an inlet passageway for a fluid to be conveyed to the filter;

(c) a second passageway (11) which provides a passageway for fluid discharged from the filter;

(d) means (2) for lowering the pressure in the second passageway (11) below the pressure in the first passageway (7);

(e) a third passageway (15) connected to the pressure-lowering means (2);

(f) a fourth passageway (8) connected to the third passageway (15) and to the filter;

(g) a fifth passageway (9) interconnecting the third (15) and fourth (8) passageways; and

(h) an orifice restriction (3) disposed in the third passageway (8), for controlling the rate of flow through the fourth (8) and fifth (9) passageways;

the first (7), second (11), third (15), fourth (8), and fifth (9) passageways, the pressure-lowering means (2), and the orifice restriction (3) being constructed and arranged so that fluid discharged from the third passageway (15) is split into a first stream flowing through the fourth passageway (8) and a second stream flowing through the fifth passageway (9), and the proportion of the fluid which is recycled to the filter before being discharged through the fifth passageway (9) is controlled and determined by the size of an orifice in the orifice restriction (3) disposed in the third passageway (8).

11. The continuous bypass filtration system of claim 8, wherein the direction of fluid flow through the filter is reversible.

12. The continuous bypass filtration system of claim 9, wherein the direction of fluid flow through the filter is reversible.

13. The adjustable recycle filtration system of claim 10, wherein the direction of fluid flow through the filter is reversible.

14. A method for controlling the proportion of a fluid which is routed to the filter of a filtration system, and the proportion of said fluid which is discharged from the system without passing through the filter, the method comprising the steps of:

(a) providing a filter for filtering the fluid;

(b) conveying a portion of the fluid to the filter through a first passageway;

(c) discharging a portion of the filtered fluid and a

portion of the unfiltered fluid through a second passageway; and

(d) controlling the proportions of the fluid flowing through the first and second passageways by disposing an orifice restriction in the first passageway.

15. A method for controlling the proportion of a fluid which is routed to the filter of a filtration system, and the proportion of said fluid which is discharged from the system without passing through the filter, the method comprising the steps of:

(a) providing a filter for filtering the fluid;

(b) conveying a portion of the fluid to the filter through a first passageway;

(c) discharging a portion of the filtered fluid and a portion of the unfiltered fluid through a second passageway; and

(d) controlling the proportions of the fluid flowing through the first and second passageways by disposing an orifice restriction in the second passageway.

16. A method for controlling the quality of a fluid which is to be purified, the method comprising the steps of:

(a) providing a filter for filtering the fluid;

(b) conveying a portion of the fluid to the filter through a first passageway;

(c) discharging a portion of the filtered fluid and a portion of the unfiltered fluid through a second passageway;

(d) controlling the proportions of the fluid flowing through the first and second passageways;

(e) analyzing the fluid discharged through the second passageway;

(f) increasing the proportion of the fluid which is conveyed to the filter through the first passageway if the quality of the discharged fluid is below industry standards; and

(g) decreasing the proportion of the fluid which is conveyed to the filter through the first passageway if the quality of the discharged fluid is appreciably above industry standards.

17. The filtration system of claim 8, wherein the pressure-lowering means include an ejector.

18. The filtration system of claim 9, wherein the pressure-lowering means include an ejector.

19. The filtration system of claim 10, wherein the pressure-lowering means include an ejector.

20. The method of claim 16, wherein the fluid is a cooking fat or a cooking oil.

ABSTRACT OF THE DISCLOSURE

An adjustable continuous filtration system; a continuous split-stream bypass filtration system; a method for controlling the proportion of a fluid recycled through a filtration system; a method for controlling the proportion of a fluid which is routed to the filter of a filtration system, and the proportion of the fluid which is discharged from the system without passing through the filter; and a method for controlling the quality of cooking fats and cooking oils. The mechanisms for controlling the proportion of fluid routed or recycled to a filter depend on the size or width of orifices in passageways conveying the fluid, including the restriction of one or more of the orifices. A needle valve beneficially provides a continuous range of variation of orifice size. If the quality of cooking fat or cooking oil discharged from the filtration system is below industry standards, the proportion of the cooking fat or cooking oil routed or recycled to the filter is increased. If the quality of the discharged cooking fat or cooking oil is appreciably above industry standards, the proportion of the cooking fat or cooking oil routed or recycled to the filter is decreased.

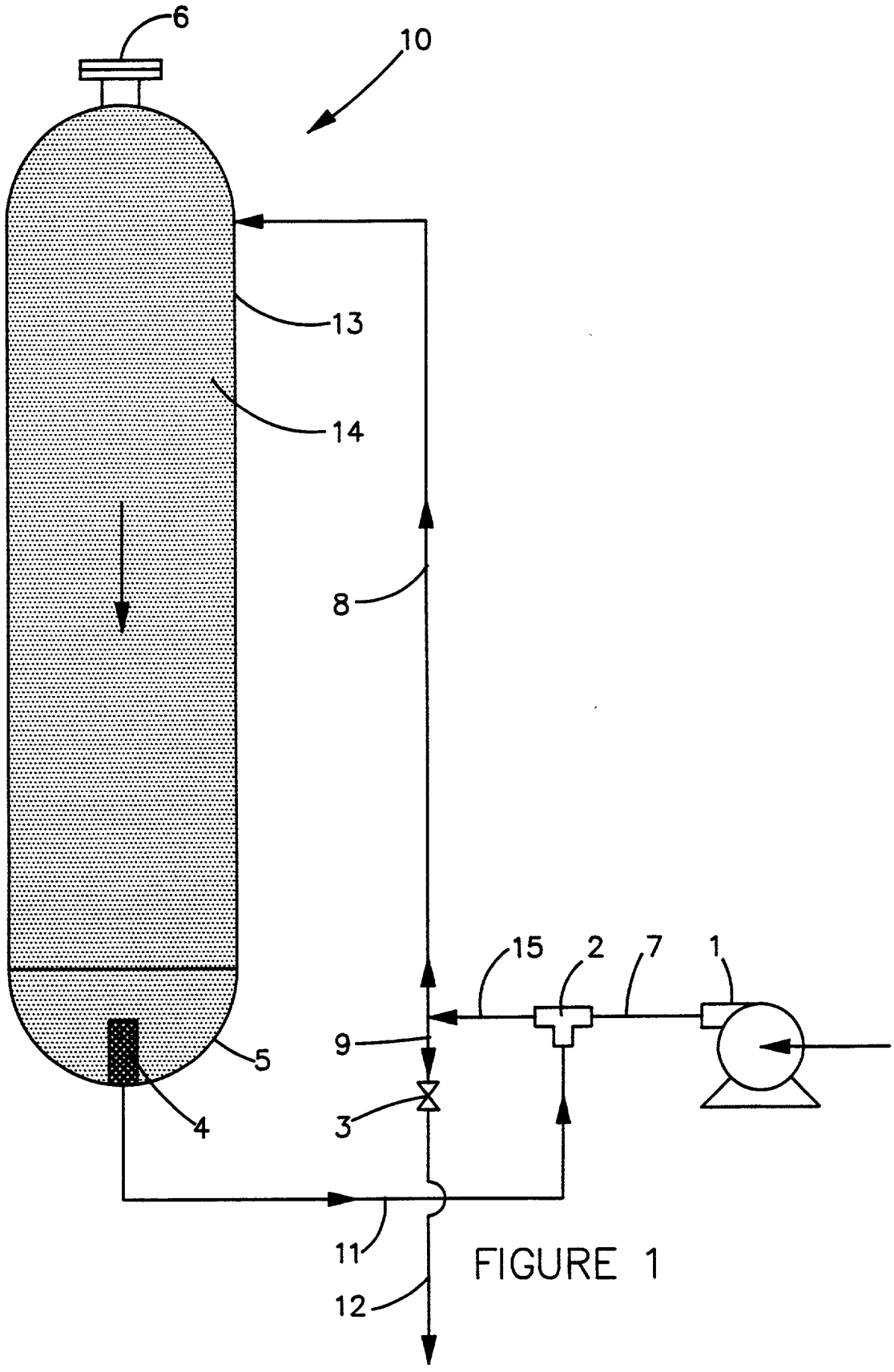

FIGURE 1

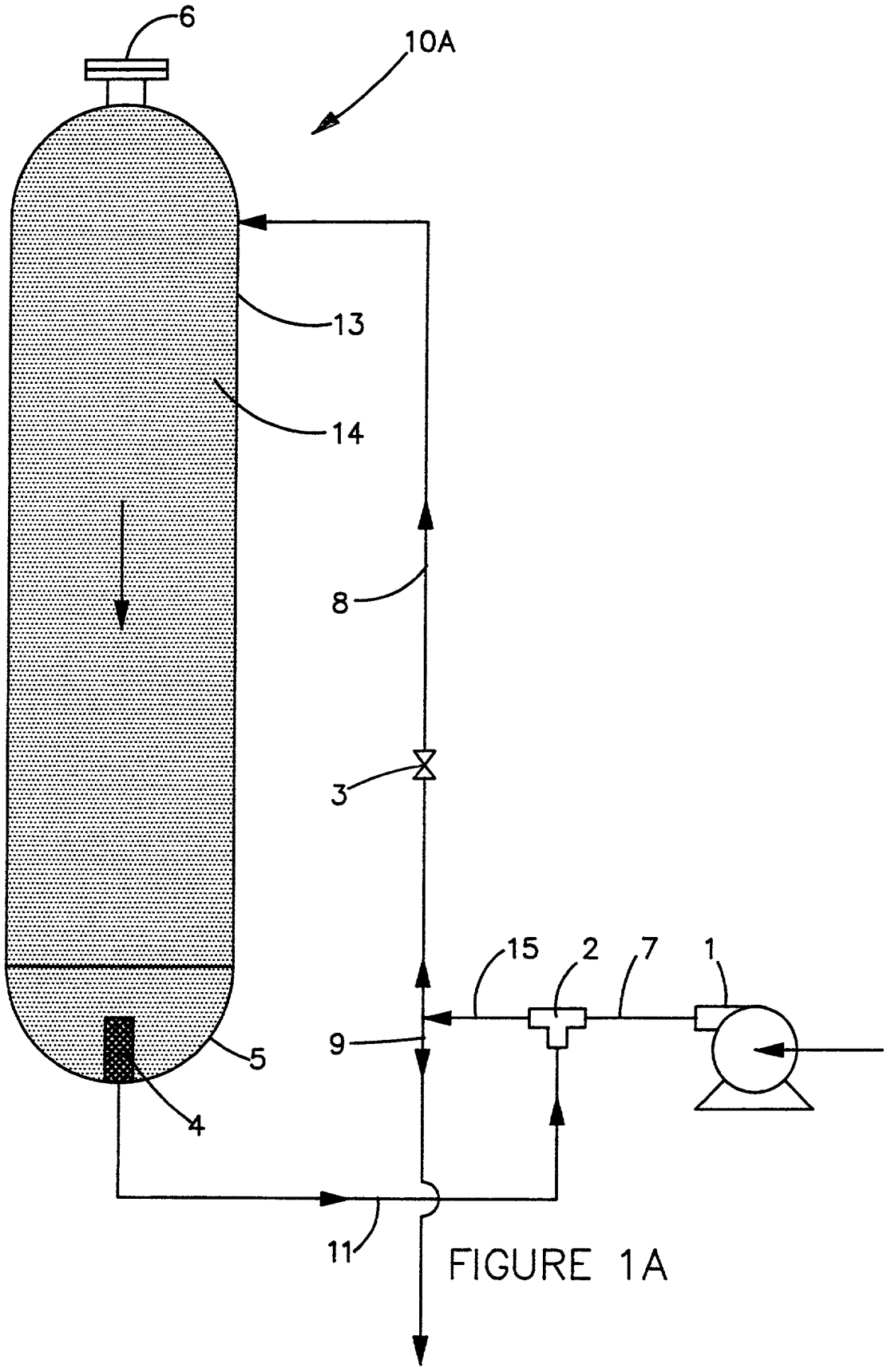

FIGURE 1A

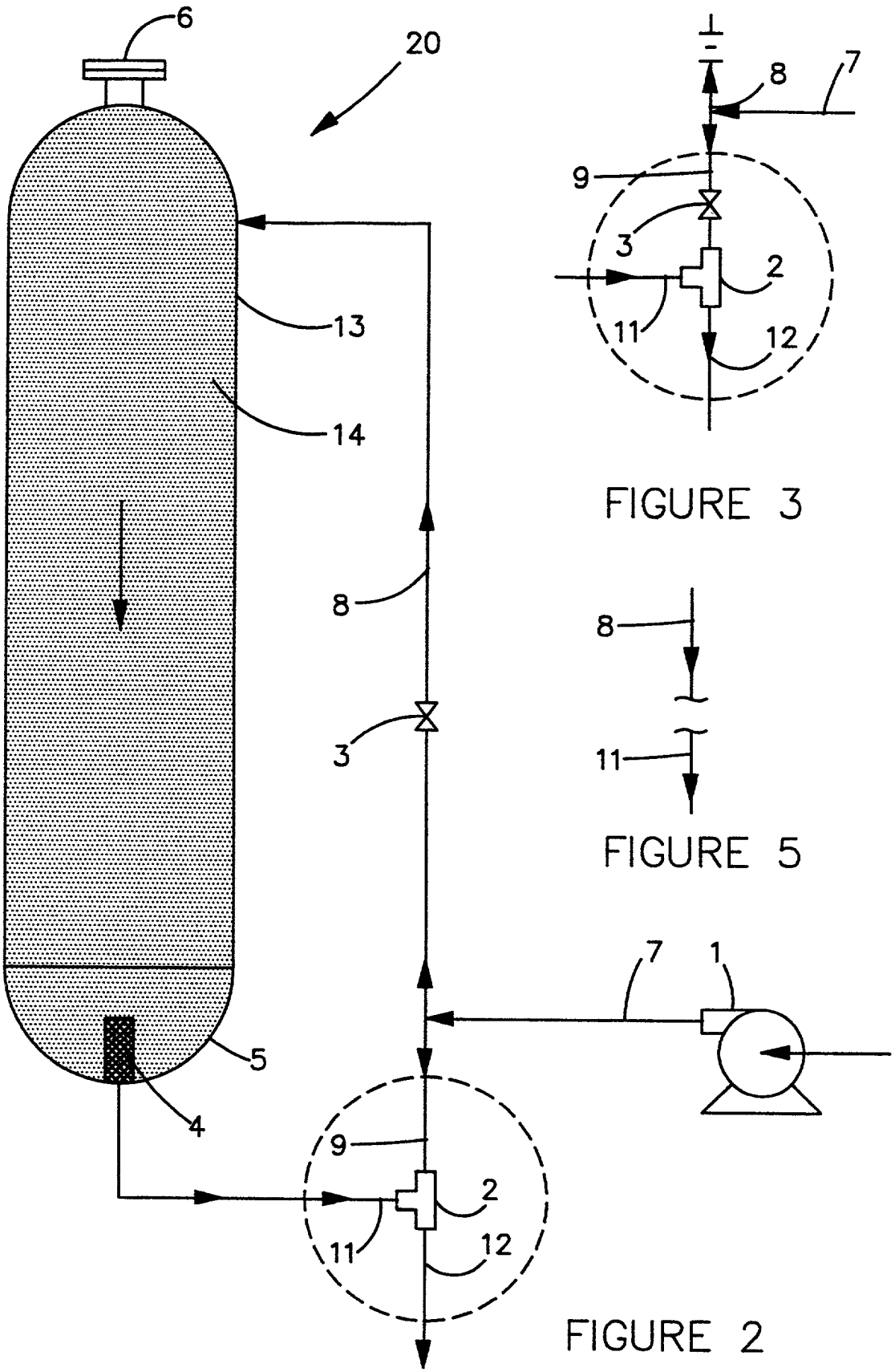

FIGURE 2

FIGURE 3

FIGURE 5

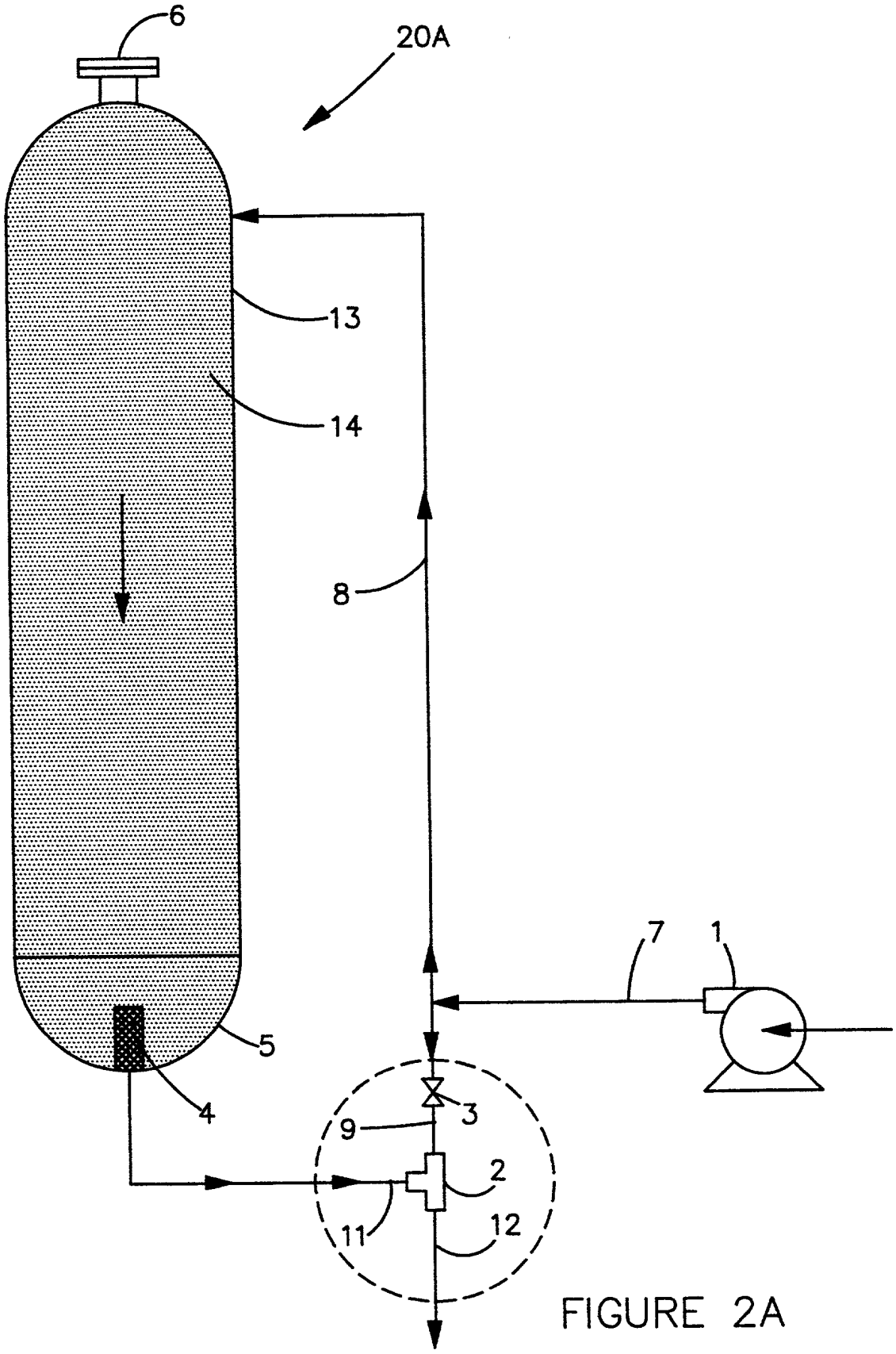

FIGURE 2A

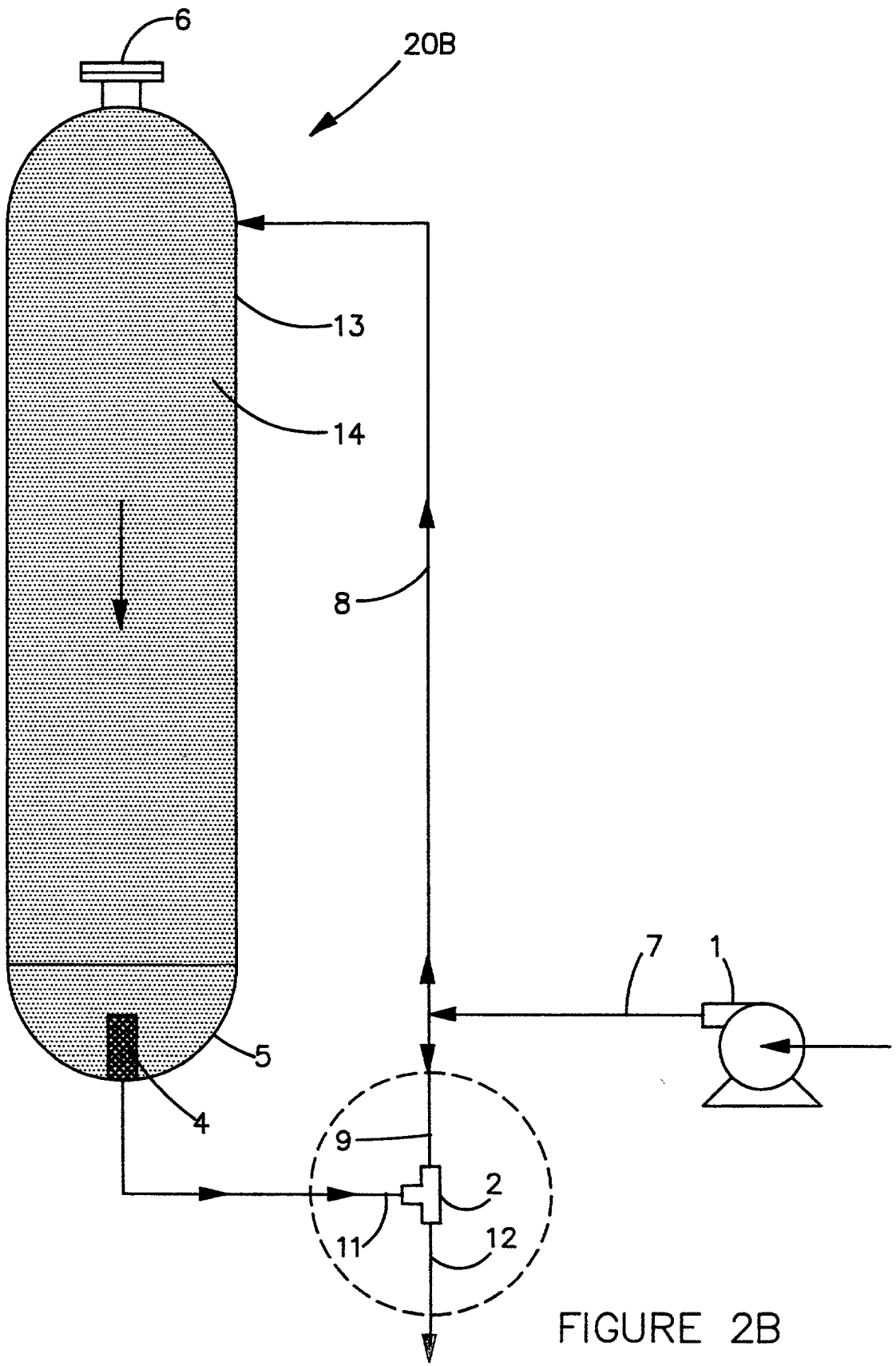

FIGURE 2B

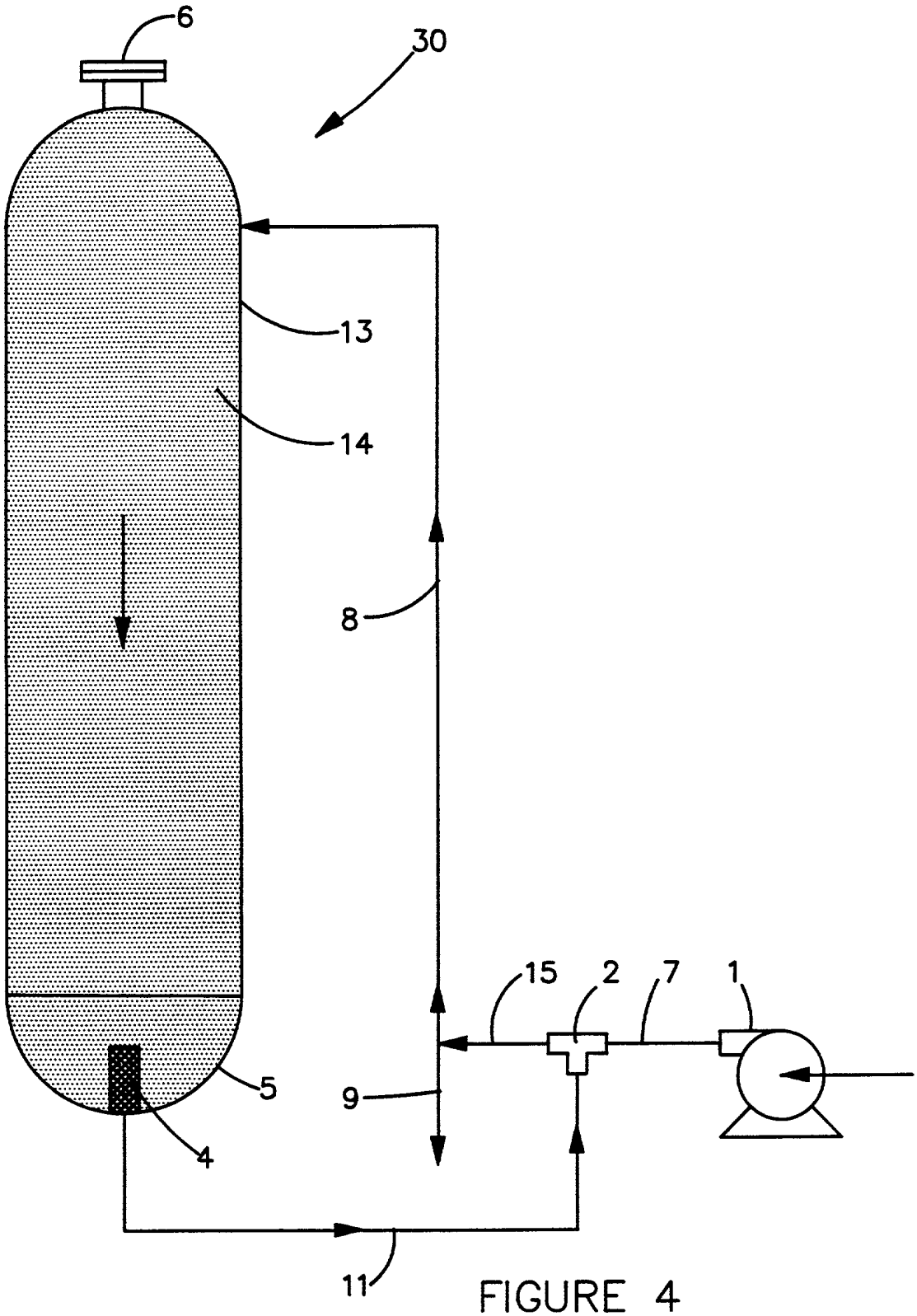

FIGURE 4

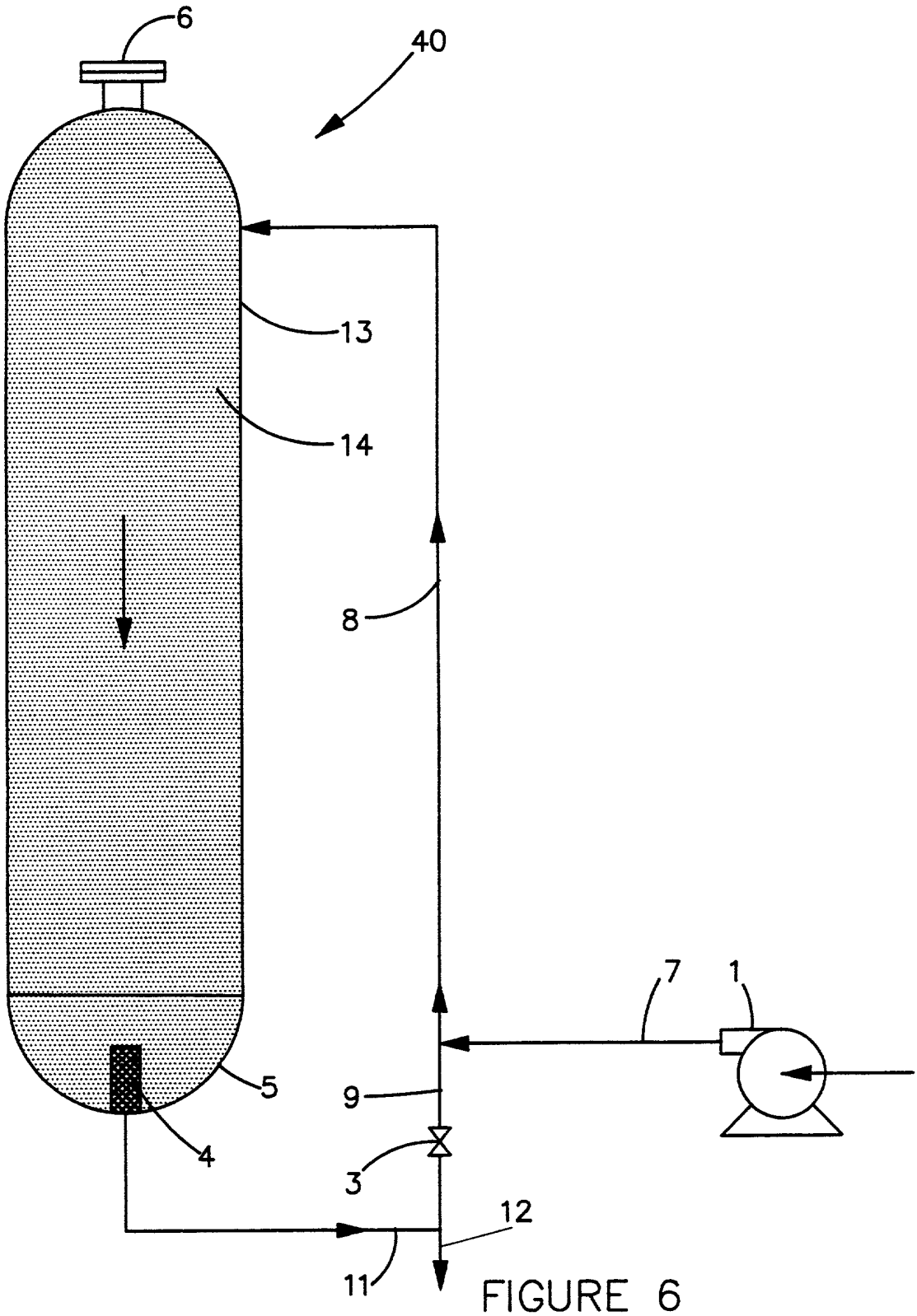

FIGURE 6

UNITED STATES OF AMERICA

DECLARATION AND POWER OF ATTORNEY

As a below-named inventor, I hereby declare that:

(a) My residence, post-office address, and citizenship are as stated below my name.

(b) I verily believe that I am the original, first, and sole inventor of the subject matter which is claimed, and for which a patent is sought on the invention entitled ADJUSTABLE CONTINUOUS FILTRATION SYSTEM FOR COOKING FATS AND COOKING OILS and the specification of which is attached hereto. (R-205-B)

(c) I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims.

(d) I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby appoint the following agent to prosecute this application, and to transact all business in the Patent and Trademark Office connected therewith:

Reginald F. Roberts, Jr.
Registration No. 29,340

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Baton Rouge, LA 70821
Tel. No. (225)343-8500

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, Section 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

At: Baton Rouge, Louisiana
this ✓FOURTH day of ✓DECEMBER, 19✓98
Signature: ✓
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